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Passive drag reduction of square back road vehicles (Article)

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Abstract

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Bluff body vehicles such as trucks and buses do not have a streamlined shapes and hence have high drag which can be reduced to make great savings in operational cost. While rectangular flaps have been widely studied as both passive add-ons and in active drag reducing systems for bluff bodies, changing the basic geometry of the flap has not been explored in literature. In this work, a baseline drag value is obtained for a simplified MAN TGX series truck in a CFD software, and the drag reduction of a proposed elliptically shaped flap is compared to aerodynamically equivalent rectangular flaps. The optimal mounting angle for both flaps is found to be 50°. A parametric study of changing the ellipse semi-major axis is carried out to find the optimal length for drag reduction. A maximum drag reduction of 11.1% is achieved using an elliptical flap with 0.12. m semi-major axis; compared to 6.37% for a length equivalent rectangular flap, and 6.84% for a surface area equivalent rectangular flap. Results of the pressure distribution and velocity flow behind the rear of the truck are also given and analyzed. © 2014.

Author keywords

Bluff body CFD Elliptic flaps Passive drag reduction Road vehicles

Indexed keywords

Engineering controlled terms: Automobile bodies Computational fluid dynamics Drag reduction Flaps Geometry Roads and streets Trucks Vehicles

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